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International Bureau

INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 6 : H02G 5/06

A2

(11) International Publication Number: **WO 99/41815**

(43) International Publication Date: 19 August 1999 (19.08.99)

(21) International Application Number: PCT/GB99/00459

(22) International Filing Date: 15 February 1999 (15.02.99)

(30) Priority Data:
9803075.2 14 February 1998 (14.02.98) GB

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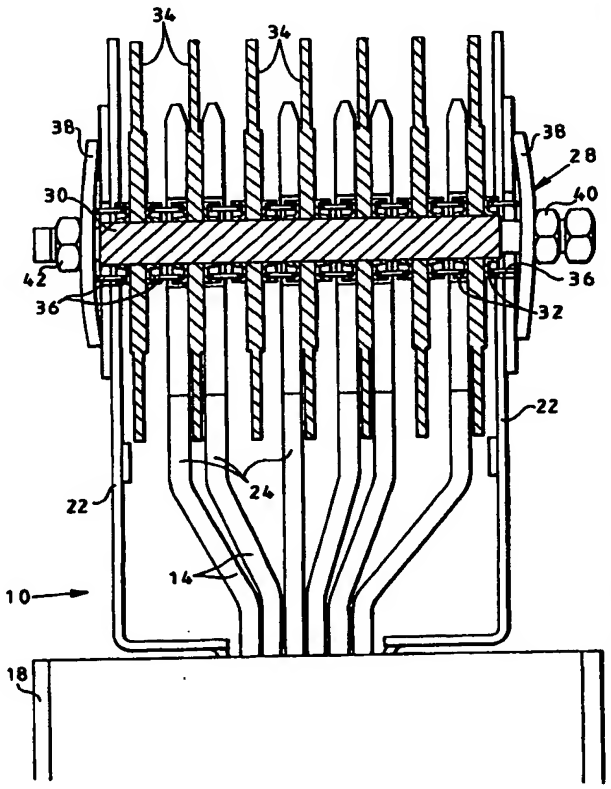
(81) Designated States: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).

Published
Without international search report and to be republished upon receipt of that report.

(54) Title: BUSBAR CONNECTOR

(57) Abstract

A connector arrangement for a busbar trunking system comprises a first connector component (10) including a plurality of first connector regions (24) arranged substantially parallel to one another, a second connector component (12) including a plurality of second connector regions (48) arranged substantially parallel to one another, and clamping means (38, 40, 42) for securing the second connector component (12) to the first connector component (10). The clamping means (38, 40, 42) is associated with a support arrangement (30, 32, 36), each of the first connector regions (24) is provided with an opening (26), the openings (26) being aligned with one another to define a passage within which the support arrangement (30, 32, 36) is located, and the second connector regions (48) are each provided with a slot (26) through which the support arrangement (30, 32, 36) extends, in use. The connector permits the interconnection of trunking units at a number of different angles, for interconnecting trunking units that do not lie substantially coaxially.



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BUSBAR CONNECTOR

This invention relates to a connector arrangement for use in a busbar trunking system. In particular, the invention relates to a connector suitable for use in a system capable of carrying high electrical currents, for example currents falling within the range 600A to 5000A.

A known busbar trunking system is constructed from a plurality of interconnected trunking units of predetermined length, each unit including a plurality of busbars in the form of electrical conductors within an elongate insulating housing such that other than at their end regions the busbars are externally insulated. At each end of the housing, the ends of the busbars define connector regions for engagement with similar connector regions of an adjacent unit. The engagement between the connector regions may be achieved by abutting the ends of the connector regions of one unit with the ends of the connector regions of an adjacent unit, and physically and electrically connecting the abutting connector regions using connector plates which overlap the connector regions and are clamped or bolted in position. Alternatively, the connector regions may be arranged to overlie one another, and may be secured to one another using an appropriate clamping arrangement, for example comprising a plurality of bolts which are arranged to extend through aligned openings in the connector regions.

It will be appreciated that, although such arrangements permit the interconnection of axially aligned units, difficulties are encountered where the trunking system is to extend around a corner. It is an object of the

invention to provide a connector for such a system permitting the connection of units which do not lie substantially coaxially.

According to the present invention there is provided a connector arrangement for a busbar trunking system comprising a first connector component including a plurality of first connector regions arranged substantially parallel to one another, a second connector component including a plurality of second connector regions arranged substantially parallel to one another, and clamping means for securing the second connector component to the first connector component, characterised in that the clamping means is associated with a support arrangement, each of the first connector regions is provided with an opening, the openings being aligned with one another to define a passage within which the support arrangement is located, and the second connector regions are each provided with a slot through which the support arrangement extends, in use.

By securing the second connector component to the first connector component using clamping means associated with the support arrangement, a connector can be provided permitting the connection of trunking units at a number of different angles.

Preferably, the support arrangement carries insulator plates located between adjacent ones of the first connector regions, the insulator plates insulating each first connector region and the respective second connector region from the remaining connector regions, in use.

The support arrangement may be arranged to permit the second connector component to be secured to the first connector component in one of several predetermined positions. In such an arrangement, the support arrangement may carry components arranged to cooperate with the slots of the second connector regions to restrict angular movement of the second connector component relative to the first connector component.

Alternatively, the support arrangement may be arranged to permit the first and second connector components to be secured to one another in any angular orientation falling within a predetermined range.

The connector regions of each of the first and second connector components are conveniently arranged in a non-symmetrical pattern. The risk of incorrect, reverse connection of the connector components is thus reduced.

The support arrangement, and the insulator plates carried thereby, conveniently take the form of a separate assembly which is securable to the remainder of the first connector component.

The invention further relates to a first connector component and to a second connector component suitable for use in such a connector arrangement.

The invention will further be described, by way of example, with reference to the accompanying drawings, in which:-

Figure 1 is a sectional view of a first connector component;

Figure 2 is a view of a second connector component intended to be used with the first connector component;

Figure 3 is a diagram illustrating part of a connector region;

Figures 4a and 4b are front and rear views of an abutment member forming part of the first connector component; and

Figures 5a and 5b are views similar to Figures 4a and 4b illustrating an alternative abutment member.

The connector illustrated in the accompanying drawings comprises a first connector component 10 formed at one end of a first busbar trunking unit and arranged to cooperate with a second connector component 12 formed at the opposite end of a second busbar trunking unit to provide electrical connections between the busbars 14, 16 extending through respective electrically insulating housings 18, 20 of the two units.

The first connector component 10 comprises a pair of housing members 22 mounted upon the unit housing 18, the housing members 22 extending substantially parallel to one another. The ends of the busbars 14 are located between the housing members 22, the end of each busbar 14 defining a connector region 24, the regions 24 each extending substantially parallel to the housing members 22. As illustrated in Figure 3, each region 24 is provided with a slot 26 extending in the lengthwise direction of the busbar 14, the slots 26 of the regions 24 aligning with one another to define a groove or channel in the end of the unit. Similar slots

are provided in the housing members 22, the slots of the housing members 22 aligning with the slots 26 of the regions 24.

A support assembly 28 is located within the groove or channel defined by the slots 26 of the regions 24, the support assembly 28 comprising an elongate tubular member 30 of substantially square cross-section, the member 30 carrying a plurality of dished abutment members 32 and a plurality of insulator plates 34. As shown most clearly in Figures 4a and 4b, the abutment members 32 are square in plan view and each includes a central opening of substantially square cross-section which is dimensioned to receive the member 30. The abutment members 32 each include an inner upstanding wall or boss 32a which surrounds the opening and is arranged to engage the outer surface of the member 30, thereby non-rotatably mounting the abutment members 32 on the member 30 in a manner permitting longitudinal sliding movement of the abutment members 32 along the member 30. The insulator plates 34 are conveniently also provided with openings dimensioned to substantially prevent rotation of the insulator plates 34 relative to the member 30, but to permit sliding movement therebetween in the direction lengthwise of the member 30. A respective insulator plate 34 is located between each busbar region 24 and its neighbouring region 24, and a pair of abutment members 32, positioned with their open faces mutually presented, are disposed between adjacent plates 34.

Respective coil springs 36 are located between each pair of the abutment members 32, and between abutment members 32 engaging the outer faces of the outermost plates 34 and load transmitting washers 38 which are located externally of the housing members 22. A bolt 40 extends

through the load transmitting washers 38, the bolt extending within the hollow passage defined by the member 30 and engaging a nut 42 which is held captive relative to one of the housing members 22.

The external side dimension of the abutment members 32 is just less than the width of the slots 26 in the busbar regions 24 and certain of the abutment members 32 are received within the slots 26 of the regions 24, thus locking those abutment members 32 and the member 30 against rotation relative to the regions 24. The outer periphery of each of the abutment members 32 is defined by an upstanding wall 32b.

The first connector component 10 illustrated in Figure 1 is intended to cooperate with the second connector component 12 illustrated in Figure 2. The second connector component comprises a pair of housing members 46 which are similar to those of the first connector component 10 but spaced apart by a distance slightly smaller than that by which the housing members 22 are spaced apart to permit the housing members 46 of the second connector component 12 to be received between the housing members 22 of the first connector component 10 with the outer surfaces of the housing members 46 engaging the inner surfaces of the housing members 22. Located between the housing members 46 are a plurality of connector regions 48 defined by the end parts of the busbars 16. As with the regions 24 of the first connector component 10, slots 26 are formed in the ends of the regions 48, the slots 26 being aligned with one another to define a groove or channel. The slots 26 include sides which are parallel to one another and parallel to the length of the busbars, the separation of the sides being substantially equal to the width of the abutment members 32.

In order to provide an electrical connection between the busbars 14, 16, the first and second connector components 10, 12 are brought into engagement with one another, introducing the housing members 46 and regions 48 of the busbars 16 between the housing members 22 of the first connector component. The spacing of the regions 48 of the busbars 16 is such that such introduction of the second connector component 12 to the first connector component 10 results in one of the regions 48 being introduced between each pair of adjacent insulator plates 34 to overlap and engage the respective region 24 of the busbar 14 located between that pair of insulator plates 34. As the second connector component 12 is introduced into the first component 10, those abutment members 32 lying outside of a region 24 of a busbar 14 are received within the slots provided in the regions 48. As the side dimension of the abutment members 32 matches the width of the slots in the regions 48 angular movement of the abutment members 32 relative to the regions 48 is prevented. The regions 48 are thus keyed by the abutments 32 to the member 30 which in turn is keyed to the regions 24 by others of the abutment members 32.

After the first and second connector components 10, 12 have been moved to this position, the bolt 40 is tightened, the tightening of the bolt 40 resulting in the transmission of a load through the load transmitting washers 38 to the housing members 22, moving the housing members 22 towards each other and into gripping engagement with the housing members 48 of the second connector components 12 thus securing the first and second connector components 10, 12 to one another.

Where appropriate, busbar trunking units will have one end defining connector components 10 and the opposite end defining connector components 12, so that a busbar trunking system can be constructed by connecting end to end a plurality of substantially identical units. It will be appreciated that the insulator plates 34 are all provided at the same end of the busbar trunking unit. After connection of the units to one another and tightening has taken place, an appropriate cover can be located over the interconnected ends of the busbar trunking units.

It will be appreciated that the first and second connector components 10, 12 differ from one another only in that the first connector component 10 includes the support assembly 28. If desired, the trunking unit may be supplied without the support assembly 28 secured thereto, thus permitting assembly of the trunking unit separately of the support assembly 28. When the trunking is being fitted in the desired location, the support assembly is secured to the trunking unit by introducing the insulator plates between the connector regions 24, and locating the abutment members 32 and the member 30 within the slots 26 of the connector regions 24.

It will be appreciated that the use of abutment members 32 of substantially square cross-sectional shape permits trunking units to be connected to one another either where the housings 18, 20 extend substantially in rectilinear alignment, or where the housings 18, 20 extend perpendicularly to one another. However the arrangement may be modified by replacing the abutment members 32 of substantially square cross-section with abutment members 33 of substantially circular cross-section as illustrated in Figures 5a and 5b, the diameter of the abutment members 33 being substantially equal to the width of the slots 26

provided in the regions 24, 48. It will be appreciated that the use of such circular abutment members 33 permits the first and second connector components 10, 12 to be secured to one another through a wide range of angles, and is not restricted to the ducts being either coaxial or perpendicular to one another.

It will be appreciated from the arrangements illustrated in Figures 1 and 2 that the regions 24, 48 are located non-symmetrically between the housing members 22, 46 with the result that connection of the busbars 14 to the incorrect ones of the busbars 16 can be avoided as the end regions 48 can only be moved into overlapping engagement with the regions 24 when the busbars 16 engage the correct ones of the busbars 14. When units are incorrectly orientated, with the result that the busbars 16 would engage the incorrect ones of the busbars 14, it will be appreciated that the only contact which can be achieved between the busbars 14, 16 is the abutting of certain of the ends of the regions 48 with the regions 24, and that the overlapping engagement which is required in order to secure the first and second connector components 10, 12 to one another cannot be achieved.

Although the embodiment illustrated in the accompanying drawings has six busbars extending through each housing, it will be appreciated that the invention is also applicable to arrangements having fewer, for example three, four or five busbars. Further, a greater number of busbars may be provided if desired. In each case, the connector regions of the busbars are arranged non-symmetrically as described hereinbefore in order to ensure that connection of adjacent trunking units can be achieved in only one angular orientation about the longitudinal axis of one of the trunking units

relative to the other trunking unit. It will be appreciated that incorrect, reverse connection of the busbars is thereby avoided, whilst the connection of trunking units to one another so that the units are not coaxial, to permit the trunking system to extend around a corner, is permitted.

Where a higher current is to be carried by the busbars, the busbar units can be arranged in pairs edge to edge with their coplanar connector components welded together along the abutting edges. In effect therefore each high current unit is a double unit.

CLAIMS

1. A connector arrangement for a busbar trunking system comprising:

a first connector component (10) including a plurality of first connector regions (24) arranged substantially parallel to one another, a second connector component (12) including a plurality of second connector regions (48) arranged substantially parallel to one another, and clamping means (38, 40, 42) for securing the second connector component (12) to the first connector component (10), characterised in that

the clamping means (38, 40, 42) is associated with a support arrangement (30, 32, 36), each of the first connector regions (24) is provided with an opening (26), the openings (26) being aligned with one another to define a passage within which the support arrangement (30, 32, 36) is located, and the second connector regions (48) are each provided with a slot (26) through which the support arrangement (30, 32, 36) extends, in use.

2. A connector arrangement is claimed in Claim 1, wherein the support arrangement (30, 32, 36) carries insulator plates (34) located between adjacent ones of the first connector regions (24), the insulator plates (34) insulating each first connector region (24) and the respective second connector region (48) from the remaining connector regions (24, 48), in use.

3. A connector arrangement as claimed in Claim 2, wherein the support arrangement (30, 32, 36) and the insulator plates (34) carried

thereby take the form of a separate assembly which is securable to the remainder of the first connector component (10).

4. A connector arrangement as claimed in Claim 1, 2 or 3, wherein the support arrangement (30, 32, 36) is arranged to permit the second connector component (12) to be secured to the first connector component (10) in one of several predetermined positions.

5. A connector arrangement as claimed in any one of the preceding claims, wherein the support arrangement (30, 32, 36) includes components (32) arranged to cooperate with the slots (26) of the second connector regions (48) to restrict angular movement of the second connector component (12) relative to the first connector component (10).

6. A connector arrangement as claimed in Claim 1, 2 or 3, wherein the support arrangement (30, 33, 36) is arranged to permit the first and second connector components (10, 12) to be secured to one another in any angular orientation falling within a predetermined range.

7. A connector arrangement as claimed in any one of the preceding claims, wherein the connector regions (24, 48) of the first and second connector components (10, 12) are arranged in a non-symmetrical pattern.

8. A support arrangement assembly (30, 32, 36) adapted for use in a connector arrangement as claimed in any one of the preceding claims.

9. A support arrangement assembly (30, 32, 36) as claimed in Claim 8, the assembly carrying insulator plates (34) adapted to be located between adjacent connector regions (24) of a connector component (10) for a busbar.

10. A connector component (10, 12) adapted for use in a connector arrangement as claimed in any one of Claims 1 to 7, the connector component (10, 12) being connectable to another connector component (10, 12) by means of a support arrangement (30, 32, 36) securably locatable in a passage defined by the first-mentioned connector component (10).

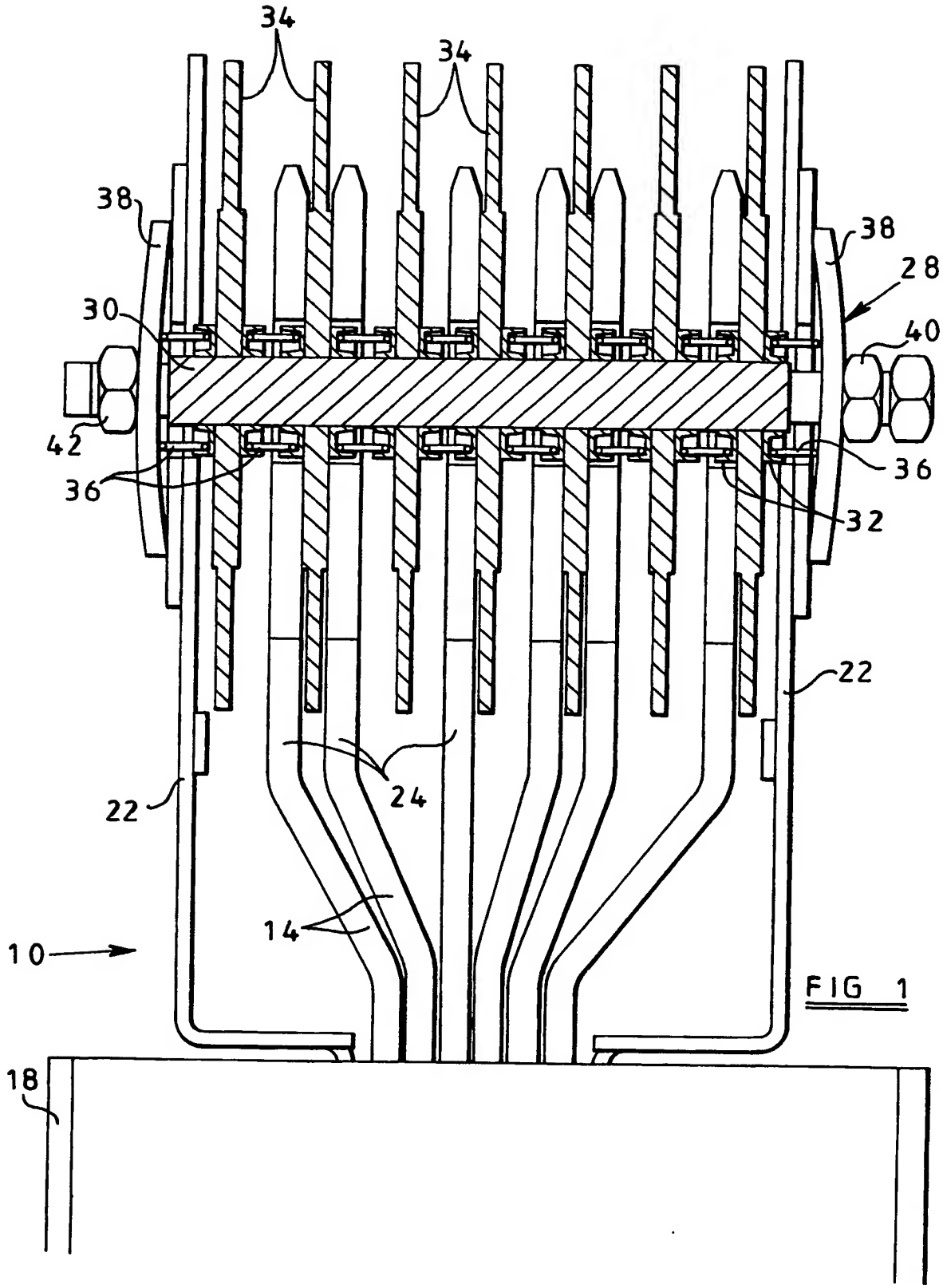


FIG 1

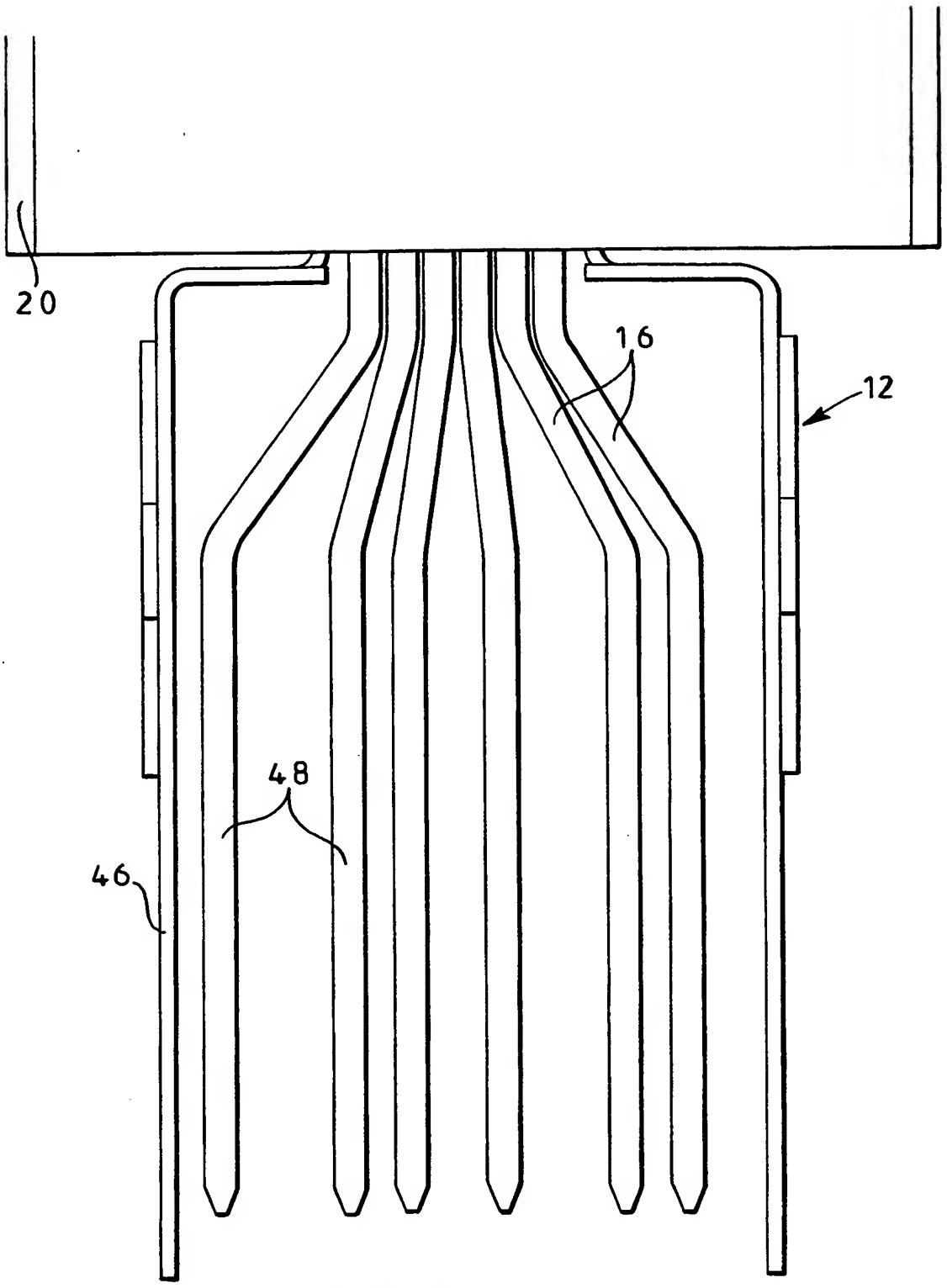


FIG 2

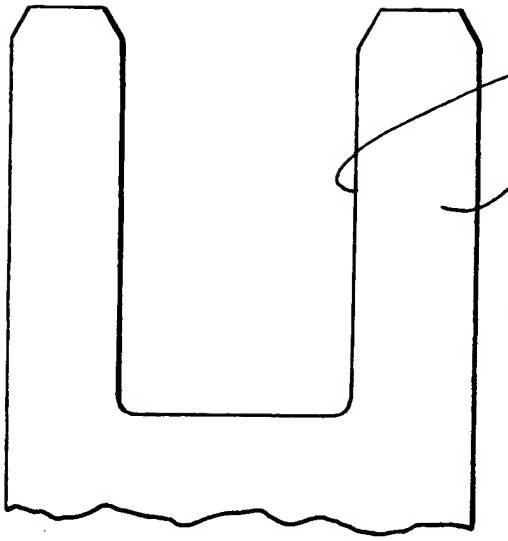


FIG 3

FIG 4a

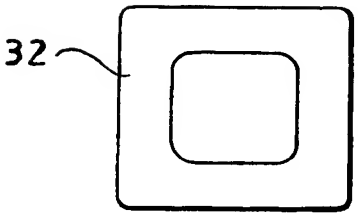


FIG 4b

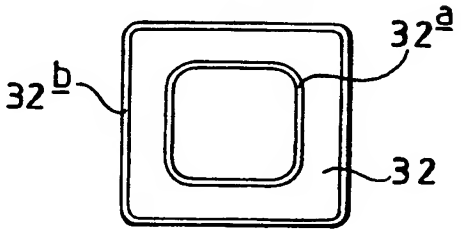


FIG 5a

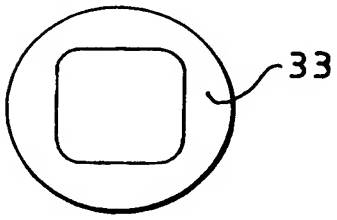
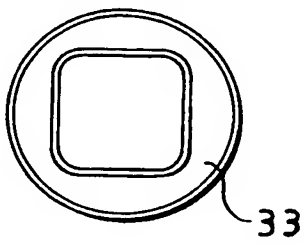


FIG 5b



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(81) Designated States: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).

Published
With international search report.
Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.

(88) Date of publication of the international search report:
30 September 1999 (30.09.99)

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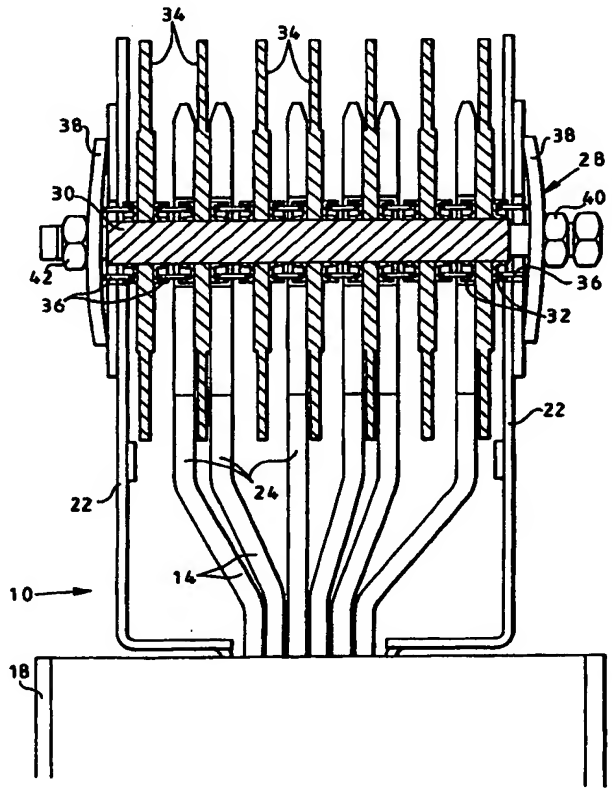
(57) Abstract

A connector arrangement for a busbar trunking system comprises a first connector component (10) including a plurality of first connector regions (24) arranged substantially parallel to one another, a second connector component (12) including a plurality of second connector regions (48) arranged substantially parallel to one another, and clamping means (38, 40, 42) for securing the second connector component (12) to the first connector component (10). The clamping means (38, 40, 42) is associated with a support arrangement (30, 32, 36), each of the first connector regions (24) is provided with an opening (26), the openings (26) being aligned with one another to define a passage within which the support arrangement (30, 32, 36) is located, and the second connector regions (48) are each provided with a slot (26) through which the support arrangement (30, 32, 36) extends, in use. The connector permits the interconnection of trunking units at a number of different angles, for interconnecting trunking units that do not lie substantially coaxially.



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EE	Estonia	**LR**	Liberia	**SG**	Singapore		

INTERNATIONAL SEARCH REPORT

Int tional Application No
PCT/GB 99/00459

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 H02G5/06

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 6 H02G

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X Y A	GB 1 177 894 A (WESTINGHOUSE ELECTRIC CORPORATION) 14 January 1970 see page 2, line 68 - page 3, line 57; figures 3,5,9	1-3 4,5,7 8-10
Y	WO 96 29768 A (KLOECKNER MOELLER GMBH ;BROOKS KEVIN (GB); BUTCHER ROBERT (GB); RE) 26 September 1996 see page 5, line 11 - line 19; figure 1	7
Y	US 3 459 872 A (WEIMER CHARLES L ET AL) 5 August 1969 see column 4, line 72 - column 5, line 58	4,5

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[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

° Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
2 July 1999	06/08/1999

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Criqui, J-J

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INTERNATIONAL SEARCH REPORT

Int .tional Application No
PCT/GB 99/00459

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication,where appropriate, of the relevant passages	Relevant to claim No.
A	GB 1 167 430 A (SQUARE D COMPANY) 15 October 1969 see page 1, line 16 - line 48; figures 1,2,5,6	1-10

Form PCT/ISA/210 (continuation of second sheet) (July 1992)

INTERNATIONAL SEARCH REPORT

Information on patent family members

Int tional Application No
PCT/GB 99/00459

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
GB 1177894 A	14-01-1970	BE 719300 A	16-01-1969
		FR 1578336 A	14-08-1969
		US 3519730 A	07-07-1970
WO 9629768 A	26-09-1996	GB 2300762 A	13-11-1996
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US 3459872 A	05-08-1969	DE 1690492 A	03-06-1971
GB 1167430 A	15-10-1969	US 3472946 A	14-10-1969